TABLE AP1-3. UNDEFINED ECM
6 January 2011

DRAWING NO. (NOTE 1)	DRAWING DATE	DESCRIPTION	DESIGNER	DDESB REVIEW DATE (IF KNOWN)	COMMENTS: (NOTES 2 AND 3)	NOTES:
104260 & 104261	15-Jul-27	RC Arch	Bureau Y&D	2004	DDESB review of drawing observed that headwall is only 6 inches thick and that 4 X 4 wire mesh was used for reinforcement in the headwall. Treat as Undefined ECM. The door is identified as metal covered and a large ventilator is mounted in the headwall over the door. The drawing shows the magazine was constructed at Naval Mine Depot, Yorktown, VA, which is now called NWS Yorktown. An analysis of the stresses on the arch (from dead loads and blast loads) is provided by Bureau Y&D Drawing 104714.	
107368	20-Apr-29	RC Arch	Bureau Y&D	2004	DDESB review of drawing observed that headwall is only 6 inches thick and that 4 X 4 wire mesh was used for reinforcement in the headwall. Treat as Undefined ECM. The drawing shows the magazine was constructed at Naval Ammunition Depot, Hawthorne, NV, which is now an Army Ammunition Depot.	
110-25-64	1-May-42	RC Arch	COE, Sacramento Office	2004	Constructed at Sierra Ordnance Depot, Hackstaff, CA. Drawings are marked to indicate the drawing set superceded 652-686 through 652-689 (see below). Drawings show a 10-inch thick headwall and 6 X 6 wire mesh reinforcing.	
130445	5-Jan-39	See Comments.	Bureau Y&D	2004	This is a variation of a RC Box ECM. The side walls are vertical for approximately 13 feet at which point the roof begins sloping towards the peak at slightly angle. Hoists and racks are provided for moving and storaging warheads. The door consisted of a steel plate. DDESB review of drawing observed that headwall is only 6 inches thick and that 4 X 4 wire mesh was used for reinforcement in the headwall. Treat as Undefined ECM. The drawing shows the magazine was constructed at Naval Ammunition Depot, Hawthorne, NV, which is now an Army Ammunition Depot.	
133959	18-Nov-39	RC Arch	Bureau Y&D	4-Apr-84	Headwall is 6 inches thick and uses 4 X 4 mesh steel for reinforcement. Treat as Undefined.	
142199	31-Jul-40	RC Arch	Bureau Y&D	2004	DDESB review of drawing observed that headwall is only 6 inches thick and that 4 X 4 wire mesh was used for reinforcement in the headwall. Treat as Undefined ECM. The drawing shows the magazine was constructed at Naval Ammunition Depot, Hawthorne, NV, which is now an Army Ammunition Depot.	
157457	12-Apr-41	RC Arch	Bureau Y&D	2004	DDESB review of drawing observed that headwall is only 6 inches thick and that 4 X 4 wire mesh was used for reinforcement of the headwall. Treat as Undefined ECM. Drawing indicates that this design was constructed at U.S. Naval Air Station Banana River, FL, which is now called NAS Key West.	
158632	UNK	UNK	Bureau Y&D	20-Jun-84	DDESB letter of 20 June 1984 determined the magazine could not be considered a standard magazine because its construction was not equivalent to a standard magazine.	
163582 & 163583	23-May-41	RC Box	Bureau Y&D	11-May-53	Known as the Keyport Magazine. 128th (4 May 1953) and 129th (11 May 1953) ASESB minutes discuss the Keyport Magazine to great length. The 129th ASESB unanimously passed a motion to permit the Keyport Magazine to be sited for 4,000 pounds NEW with a minimum 30-foot separation distance (center to center) between Keyport Magazines. Greater separation distances would be required, if there is an unbarricaded front exposure.	
G165-177 & 178	20-Jan-53	RC Arch	Bureau Y&D	12-Apr-02	A 12 April 2002 e-mail from COE Huntsville informed DDESB that this design,located at Andersen AFB, Guam, is an Undefined structure due to the weakness of the headwall and door. Steel mesh was used vice reinforcing steel, similar to the Huntsville magazines built during WWII due to steel shortages.	
173649 through 173651	28-Aug-41	RC Box	Bureau Y&D	2004	This an early version of the Navy Smokeless Powder and Projectile Magazine and measures 52 feet X 103 feet. The design provides for glass block windows in the front wall to let in natural lighting Treat as Undefined ECM. The drawing shows the magazine was constructed at Naval Ammunition Depot, Hawthorne, NV, which is now an Army Ammunition Depot.	

TABLE AP1-3. UNDEFINED ECM
6 January 2011

DRAWING NO. (NOTE 1)	DRAWING DATE	DESCRIPTION	DESIGNER	DDESB REVIEW DATE (IF KNOWN)	COMMENTS: (NOTES 2 AND 3)	NOTES:
173658	3-Sep-41	RC Arch	Bureau Y&D	2004	DDESB review of drawing observed that headwall is only 6 inches thick and that 4 X 4 wire mesh was used for reinforcement in the headwall. Treat as Undefined ECM. The drawing shows the magazine was constructed at Naval Ammunition Depot, Hawthorne, NV, which is now an Army Ammunition Depot.	
187407 & 187408	UNK	UNK	Bureau Y&D	9-May-84	The 9 May 1984 DDESB approval letter provided an NEW rating of only 250,000 pounds. Treat as an undefined ECM.	
209854 & 209855	24-Jun-42	RC Arch	Bureau Y&D	UNK	This ECM measures 25-foot wide by 50-foot long. Its internal height is 12-foot 2-inches. Known to have been constructed at Crane Army Ammunition Plant.	
217867	14-Sep-42	RC Arch	Bureau Y&D	2004	Headwall is 6 inches thick and uses 4 X 4 wire mesh for reinforcement. Constructed at Hawthorne Army Ammunition Plant. Treat as Undefined.	
217869	14-Sep-42	RC Arch	Bureau Y&D	4-Apr-84	Headwall is 8 inches thick and uses 4 X 4 wire mesh for reinforcement. Constructed at Hawthorne Army Ammunition Plant. Treat as Undefined.	
226166	UNK	RC Box	Bureau Y&D	UNK	This design is for a 144 square-foot Fuze and Detonator Magazine. The design drawing specifies only 18 inches of soil cover. Current explosives safety criteria call for a minimum of 24 inches of earth cover. A magazine constructed to this drawing must be treated as an aboveground magazine. The addition of earth-cover, sufficient to meet current criteria, would allow this magazine to be treated as an undefined ECM. Bureau Y&D Drawing 817112 provides general details for this magazine and was used for planning purposes.	
33-03-01	9-Apr-81	RC FRELOC Stradley	COE, Savannah	14-Apr-94	A 2 March 1994 Huntsville Division, COE, letter determined that the basis for the 33-03-01 magazine design was standard magazine design 33-15-74, however, modifications were made which caused any ECM constructed IAW Drawing 33-03-01 to be considered non-standard.	
33-03-04	UNK	RC Arch	UNK	4-May-99	DDESB letter of 4 May 1999 identifies this magazine as being located at Incirlik AFB, Turkey and belonging to WSA Security. Its blast door was determined to be incapable of providing 7- or 3-Bar protection, although the magazine arch and headwall were designed to meet 7-Bar criteria.	
33-03-43	1-Apr-76	Steel Arch	COE (EUR Dist)	11-May-83	A 6 December 1982 Dept of Army, HQ, 21st Support Command (Subj: Proposed Construction of New Magazines at Larson Barracks, Kitzingen, Germany) called for the construction of 6 of these magazines. This letter also stated that DDESB-KO approval was granted on 19 April 1976, for construction of EUD-33-03-43 magazines at QRS Bindlach, Germany. The 19 April 1976 DDESB letter has not been located. These magazines were sited at a side-to-side separation distance of $0.5Q^{1/3}$ (equates to K1.25). This separation was applicable to standard ECM and to non-standard ECM (for NEWs less than 250,000 pounds HD 1.1.) Treat as an undefined ECM, until receipt of additional information to support some other designation.	
33-11-0002	27-Feb-84	Steel Arch	COE, Japan District	UNK	This design was constructed at Misawa Air Base, Honshu, Japan. Not all drawings available, but available details appear to be similar to 33-15-63 design.	
33-15-01	27-Dec-41	RC Arch	OCE	29-Oct-02	This design is different from magazine design AW 33-15-01 and 33-15-01 (Omaha District COE), listed in Table AP1-2 of TP 15. A 1950 document, which describes the history of magazines from pre-1928 to 1950, identified this magazine design as having an unreinforced steel door which had questionable blast resistance capability. Superceded by 33-15-06 of 1 August 51. Drawing 33-15-62 (13 June 1960) increased door size. An additional issue is that the headwall construction utilized steel mesh vice reinforcing bars, which was characteristic for that period due to steel shortages. COE, Huntsville, e-mail of 29 Oct 2002, to the DDESB identifies headwall design shortcomings and the need to classify the ECM as Undefined.	
33-15-01	10-Jan-52	RC Arch	COE (Louisville District)	UNK	Constructed at Bluegrass Ordnance Depot. Based on the above information for the 33-15-01 design, and the fact that the first page of the package indicates that it is based on 33-15-06, it's possible an analysis may demonstrate that this ECM could meet 7-Bar criteria.	

TABLE AP1-3. UNDEFINED ECM
6 January 2011

DRAWING NO. (NOTE 1)	DRAWING DATE	DESCRIPTION	DESIGNER	DDESB REVIEW DATE (IF KNOWN)	COMMENTS: (NOTES 2 AND 3)	NOTES:
33-15-01	2-Sep-52	RC Arch	COE (Seattle District)	UNK	This drawing number was assigned to an ECM design constructed at Ft Lewis, Washington. Each drawing indicates it was based on OCE 33-15-04, a design whose structural hardness has not been analyzed. This design measures 26 feet wide by 60 feet long and has 2 4-inch thick hinged doors, spanning a 8'6" by 8'6" opening. The door and headwall would need to be analyzed to determine their structural hardness.	
E 33-15-02	UNK	UNK	UNK	UNK	This design was identified in a 29 January 1968 study entitled "A Standard System for Type Classification of Explosives Storage Magazines" as a Type C magazine (i.e., substandard earth-covered magazine). This design requires a technical analysis on a case-by-case basis to determine the structural hardness of its door(s) and headwall.	
E 33-15-03	UNK	UNK	UNK	UNK	This design was identified in a 29 January 1968 study entitled "A Standard System for Type Classification of Explosives Storage Magazines" as a Type C magazine (i.e., substandard earth-covered magazine). This design requires a technical analysis on a case-by-case basis to determine the structural hardness of its door(s) and headwall.	
E 33-15-04	UNK	UNK	UNK	UNK	This design was identified in a 29 January 1968 study entitled "A Standard System for Type Classification of Explosives Storage Magazines" as a Type C magazine (i.e., substandard earth-covered magazine). This design requires a technical analysis on a case-by-case basis to determine the structural hardness of its door(s) and headwall.	
DEF-E-33-15-04	29 May 51, Revised 10/1/1951	RC Arch	COE (Los Angeles District)	UNK	No additional information is available.	
EUD 33-15-05	UNK	RC FRELOC Stradley	COE (EUR Dist)	UNK	A 10 April 1979 DDESB Telephone Record states that EUD drawing 33-15-05 is said to be the same as the Standard FRELOC, 33-15-13, except that the footings are similar to those of a steel arch magazine, will be submitted through channels for consideration as a standard magazine. No record was found to show that this was ever accomplished.	
33-15-07	UNK	UNK	UNK	UNK	This design was identified in a 29 January 1968 study entitled "A Standard System for Type Classification of Explosives Storage Magazines" as a Type C magazine (i.e., substandard earth-covered magazine). This design requires a technical analysis on a case-by-case basis to determine the structural hardness of its door(s) and headwall.	
33-15-08	UNK	UNK	UNK	UNK	This design was identified in a 29 January 1968 study entitled "A Standard System for Type Classification of Explosives Storage Magazines" as a Type C magazine (i.e., substandard earth-covered magazine). This design requires a technical analysis on a case-by-case basis to determine the structural hardness of its door(s) and headwall.	
E 33-15-09	UNK	UNK	UNK	UNK	This design was identified in a 29 January 1968 study entitled "A Standard System for Type Classification of Explosives Storage Magazines" as a Type C magazine (i.e., substandard earth-covered magazine). This design requires a technical analysis on a case-by-case basis to determine the structural hardness of its door(s) and headwall.	
E 33-15-10	UNK	UNK	UNK	UNK	This design was identified in a 29 January 1968 study entitled "A Standard System for Type Classification of Explosives Storage Magazines" as a Type C magazine (i.e., substandard earth-covered magazine). This design requires a technical analysis on a case-by-case basis to determine the structural hardness of its door(s) and headwall.	
33-15-11 A	Sep-76	RC FRELOC Stradley	COE (EUR Dist)	UNK	No additional information is available. Design appears to be very similar to 33-03-31 design.	
AD 33-15-11 R2	29 Dec 61, Rev 2 dated 5 Jan 62	RC Arch	AF	UNK	This magazine was listed in a 1968 document, presented by a working group meeting to standardize magazine nomenclature, as a Type B (STD) magazine for Army and Air Force use. No documentation has been found to support anything other than an undefined designation.	

TABLE AP1-3. UNDEFINED ECM
6 January 2011

DRAWING NO. (NOTE 1)	DRAWING DATE	DESCRIPTION	DESIGNER	DDESB REVIEW DATE (IF KNOWN)	COMMENTS: (NOTES 2 AND 3)	NOTES:
33-15-12	UNK	UNK	UNK	UNK	This design was identified in a 29 January 1968 study entitled "A Standard System for Type Classification of Explosives Storage Magazines" as a Type C magazine (i.e., substandard earth-covered magazine). This design requires a technical analysis on a case-by-case basis to determine the structural hardness of its door(s) and headwall.	
33-15-13	UNK	UNK	UNK	UNK	This design was identified in a 29 January 1968 study entitled "A Standard System for Type Classification of Explosives Storage Magazines" as a Type C magazine (i.e., substandard earth-covered magazine). This design requires a technical analysis on a case-by-case basis to determine the structural hardness of its door(s) and headwall.	
33-15-14	5-Sep-52	Steel Arch	OCE	UNK	Has a width of 25 feet, an arch radius of 15 feet and could have 3 possible lengths: 40, 64, or 80 feet. The design has 2 hinged doors. This design was identified in a 29 January 1968 study entitled "A Standard System for Type Classification of Explosives Storage Magazines" as a Type C magazine (i.e., substandard earth-covered magazine). This design requires a technical analysis on a case-by-case basis to determine the structural hardness of its door(s) and headwall. Drawings provided by Ft Bragg, NC.	
33-15-14	UNK	Modified FRELOC Stradley (RC Arch)	COE (EUR Dist)	5-Dec-78	This design represented a significant modification of standard ECM 33-15-13 (reduced reinforcement), and the DDESB determined it had to be considered a non-standard (undefined) until fully evaluated. No information was found to show an evaluation had ever been completed.	
33-15-19	UNK	RC Arch	AF	29-Nov-84	The DDESB determined this ECM could not be considered a standard ECM, because the headwall and doors were of weaker design than those of a concrete arch ECM that had been tested successfully. The DDESB review pertained to ECM located at Camp Edwards, Massachusetts, an Army National Guard Training Site.	
33-15-28	UNK	Steel Arch	COE (EUR Dist)	5-Aug-87	This design was initially approved by the DDESB 11 May 1983, for construction at Larson Barracks, Kitzingen, Germany, with an NEW of 4,000 pounds and a side-to-side separation of K1.25. This separation was applicable to standard ECM and to non-standard ECM (for NEWs less than 250,000 pounds HD 1.1.) Project was subsequently modified to use ECM design 33-15-208, which was almost the same as design 33-15-28 with some minor modifications. Treat as an undefined ECM.	
AW 33-15-63	5-Mar-63	Steel, Semi-Circular Arch	OCE	19-Feb-64	Approved during 225th ASESB meeting of 19 Feb 64 as a standard magazine design. A 1 Apr 87 COEHQ letter stated that ECM design AW 33-15-63 was no longer being used for new construction. Drawing AW 33-15-63 had two designs shown on it. One is a traditional magazine with a single 12-inch thick reinforced concrete headwall, while the second is a design with two headwalls and doors (flow through design). COE structural evaluation of AW 33-15-63 door in 2003 determined the door would not provide 7 or 3-Bar protection. See Note 5 of Table AP1-2.	
AW 33-15-64	10-May-63	Steel Arch	OCE	19-Feb-64	Approved during 225th ASESB meeting of 19 Feb 64 as a standard magazine design. A 1 Apr 87 COEHQ letter stated that ECM design AW 33-15-64 was no longer being used for new construction. COE structural evaluation of AW 33-15-64 door in 2003 determined the door would not provide 7 or 3-Bar protection. See Note 5 of Table AP1-2.	
33-15-65	10-Jan-63	Steel, Semi-circular Arch	OCE	19-Feb-64	This ECM was available in two widths: 8-foot and 10-foot. Approved during 225th ASESB meeting of 19 Feb 64. However, an 18 Dec 89 DDESB ltr identifies problems with this ECM being able to meet standard magazine criteria and states that the COE would be asked to redesign 33-15-65 to strengthen it. The DDESB letter further state that Drawings 33-15-74 or 421-80-01 should be used for new construction of Standard ECM. Based on headwall strength issue, allowable NEW limited to only 250,000 pounds.	

TABLE AP1-3. UNDEFINED ECM
6 January 2011

DRAWING NO. (NOTE 1)	DRAWING DATE	DESCRIPTION	DESIGNER	DDESB REVIEW DATE (IF KNOWN)	COMMENTS: (NOTES 2 AND 3)	NOTES:
AD 33-15-67 R2	5/8/1964, Rev 2 dated 8 Mar 65	Steel, Semi-Circular Arch	AF	See Comments	This ECM was required to be constructed IAW Drawing AW 33-15-63. A 13 Jan 1995 COE, Huntsville Division, ltr stated that since the design drawing calls for it to be constructed in accordance with a standard (7-Bar) design, then, by analogy, it also should be considered a standard. The design was added (at that time) to the magazine listing in DoD 6055.9-STD, based on the above COE assessment. COE structural evaluation of AW 33-15-63 door in 2003 determined the door would not provide 7 or 3-Bar protection. See Note 5 of Table AP1-2.	
AD 33-15-68 R2	5/8/1964, Rev 2 dated 8 Mar 65	Steel, Semi-Circular Arch	AF	See Comments	This ECM was required to be constructed IAW Drawing AW 33-15-63. A 13 Jan 1995 COE, Huntsville Division, ltr stated that since the design drawing calls for it to be constructed in accordance with a standard (7-Bar) design, then, by analogy, it also should be considered a standard. The design was added (at that time) to the magazine listing in DoD 6055.9-STD, based on the above COE assessment. COE structural evaluation of AW 33-15-63 door in 2003 determined the door would not provide 7 or 3-Bar protection. See Note 5 of Table AP1-2.	
AD 33-15-69 R2	8-May-64	Steel, Semi-Circular Arch	AF	See Comments	This ECM was required to be constructed IAW Drawing AW 33-15-63. A 13 Jan 1995 COE, Huntsville Division, ltr stated that since the design drawing calls for it to be constructed in accordance with a standard (7-Bar) design, then, by analogy, it also should be considered a standard. The design was added (at that time) to the magazine listing in DoD 6055.9-STD, based on the above COE assessment. COE structural evaluation of AW 33-15-63 door in 2003 determined the door would not provide 7or 3-Bar protection. See Note 5 of Table AP1-2.	
AD 33-15-70 R1	8-May-64	Steel, Semi-Circular Arch	AF	See Comments	This ECM was required to be constructed IAW Drawing AW 33-15-64. A 13 Jan 1995 COE, Huntsville Division, ltr stated that since the design drawing calls for it to be constructed in accordance with a standard (7-Bar) design, then, by analogy, it also should be considered a standard. The design was added (at that time) to the magazine listing in DoD 6055.9-STD, based on the above COE assessment. COE structural evaluation of AW 33-15-64 door in 2003 determined the door would not provide 7or 3-Bar protection. See Note 5 of Table AP1-2.	
33-15-71	UNK	Steel Arch	COE (EUR Dist)	UNK	An informal DDESB magazine listing, dated 26 Aug 80, shows this magazine design having only a 250,000-pound capacity. Treat as an undefined ECM until additional information is provided which supports another designation.	
AD 33-15-72	23-Mar-67	See Comments.	AF	UNK	This drawing identifies two ECM types. The first is a steel, oval arch ECM and the second is a steel arch ECM. Both types must be constructed IAW arch requirements of Drawing AW 33-15-64 and are economical open-ended models of the magazine design. Separate barricades may be used where end protection is necessary. These structures were used for covered field storage in austere areas. The design drawing designates these magazines as Combat Zone Type.	
33-15-208	UNK	Steel Arch	COE (EUR Dist)	8/5/1987 message	This design was initially approved by the DDESB 11 May 1983, for construction at Larson Barracks, Kitzingen, Germany, with an NEW of 4,000 pounds and a side-to-side separation of K1.25. This separation was applicable, at the time, to the siting of standard ECM and to non-standard ECM (for NEWs less than 250,000 pounds HD 1.1.) Project was subsequently modified to use ECM design 33-15-208, which was almost the same as design 33-15-28 with some minor modifications. Treat as an undefined ECM until further information is received to justify a designation change.	
E 33-31-01	UNK	UNK	UNK	UNK	This design was identified in a 29 January 1968 study entitled "A Standard System for Type Classification of Explosives Storage Magazines" as a Type C magazine (i.e., substandard earth-covered magazine). This design requires a technical analysis on a case-by-case basis to determine the structural hardness of its door(s) and headwall.	

TABLE AP1-3. UNDEFINED ECM
6 January 2011

DRAWING NO. (NOTE 1)	DRAWING DATE	DESCRIPTION	DESIGNER	DDESB REVIEW DATE (IF KNOWN)	COMMENTS: (NOTES 2 AND 3)	NOTES:
E 33-31-02	UNK	UNK	UNK	UNK	This design was identified in a 29 January 1968 study entitled "A Standard System for Type Classification of Explosives Storage Magazines" as a Type C magazine (i.e., substandard earth-covered magazine). This design requires a technical analysis on a case-by-case basis to determine the structural hardness of its door(s) and headwall.	
33-33-01	5-Jan-57	RC Arch	COE (Tulsa District)	UNK	Drawings provided by Beale AFB, CA.	
33-33-03	UNK	Modified FRELOC Stradley (RC Arch)	COE (EUR District)	UNK	A 4 May 1978 DDESB -KT memo to COE European Division, mentions this design. It appears to be a design variation of 33-15-13, however, no details are available and it must be considered as Undefined until additional details are provided.	
E 33-31-04	UNK	UNK	UNK	UNK	This design was identified in a 29 January 1968 study entitled "A Standard System for Type Classification of Explosives Storage Magazines" as a Type C magazine (i.e., substandard earth-covered magazine). This design requires a technical analysis on a case-by-case basis to determine the structural hardness of its door(s) and headwall.	
E 33-31-05	UNK	UNK	UNK	UNK	This design was identified in a 29 January 1968 study entitled "A Standard System for Type Classification of Explosives Storage Magazines" as a Type C magazine (i.e., substandard earth-covered magazine). This design requires a technical analysis on a case-by-case basis to determine the structural hardness of its door(s) and headwall.	
E 33-31-06	UNK	UNK	UNK	UNK	This design was identified in a 29 January 1968 study entitled "A Standard System for Type Classification of Explosives Storage Magazines" as a Type C magazine (i.e., substandard earth-covered magazine). This design requires a technical analysis on a case-by-case basis to determine the structural hardness of its door(s) and headwall.	
FI-350 through FI-356, modified with larger door	18-Apr-51	RC Arch	OCE	8-Apr-03	This design reflects FI-350 through FI-356, with a modified door. The larger door was evaluated by the Huntsville COE and determined to be incapable of providing 7-Bar protection. Their determination is documented in an e-mail to the DDESB (8 Apr 2003). The original door design measures 9'11 3/4" H X 8 5 1/2" W (double, hinged, swinging doors). The modified larger door design (11' H X 10' 1 1/2" W) is also a double, hinged, swinging door. Treat as Undefined ECM.	
357428 through 357430	9-Aug-44	RC Arch	Bureau Y&D	UNK	A WW II Navy Standard design. It was upgraded by Bureau Y&D Drawing 626739 to provide a stronger headwall and door design, which was then accepted as a Standard magazine design.	
359870	UNK	RC Box	Bureau Y&D	UNK	This is a 68 square-foot Ready Magazine. The design drawing calls for only 18-inches of soil cover. Current explosives safety criteria call for a minimum of 24-inches of earth cover. A magazine constructed to this drawing must be treated as an aboveground magazine. The addition of earth-cover, sufficient to meet current criteria, will allow this magazine to be treated as an undefined ECM. Bureau Y&D Drawing 817112 provided general details for this magazine and was used for planning purposes.	
359871	UNK	RC Box	Bureau Y&D	UNK	This design provides construction details for both a 192 square-foot Fuze and Detonator ECM and a 266 square-foot Black Powder ECM. The design drawing specifies only 18-inches of soil cover. Current explosives safety criteria require a minimum of 24-inches of earth cover. A magazine constructed to this drawing will have to be treated as an aboveground magazine. The addition of earth-cover, sufficient to meet current criteria, will allow this magazine to be treated as an undefined ECM. Bureau Y&D Drawing 817112 provided general details for this magazine and was used for planning purposes.	
387740	15-Mar-45	RC Box	Bureau Y&D	UNK	Smokeless Powder Magazine. Has glass blocks in the face to allow natural lighting to enter.	

TABLE AP1-3. UNDEFINED ECM
6 January 2011

DRAWING NO. (NOTE 1)	DRAWING DATE	DESCRIPTION	DESIGNER	DDESB REVIEW DATE (IF KNOWN)	COMMENTS: (NOTES 2 AND 3)	NOTES:
387744	22-Mar-45	RC Box	Bureau Y&D	9-May-84	This design provides construction details for both a 10-foot X 10-foot and a 10-foot X 14-foot Fuze and Detonator ECM. The design drawing specifies only 15-inches of soil cover. Current explosives safety criteria require a minimum of 24-inches of earth cover. A magazine constructed to this drawing will have to be treated as an aboveground magazine. The addition of earth-cover, sufficient to meet current criteria, will allow this magazine to be treated as an undefined ECM.	
387745	22-Mar-45	RC Arch	Bureau Y&D	9-May-84	This design is for a 25-foot X 20-foot Fuze and Detonator Magazine. A 9 May 1984 DDESB memorandum stated that the magazine was rated for only 250,000 pounds NEW. Treat as an undefined ECM.	
411428	UNK	UNK	Bureau Y&D	9-May-84	DDESB letter of 9 May 1984 showed that the magazine was rated for only 250,000 pounds NEW. Treat as an undefined ECM.	
421-80-06	1-Oct-99	RC Box	COE	2-Apr-02	Known as the Air Force "Hayman Igloo". This design represents an upgraded version of the AF Modular Storage Magazine (MSM) that was approved by the DDESB in 1994. 421-80-06 and the MSM design were previously considered as 7-Bar designs. Their rating was downgraded to "Undefined" by the DDESB in Apr 2002 due to identified problems with the door design. The door and door frame can be upgraded per DDESB memo of 17 Apr 02 in order to be again considered a 7-Bar design. See 421-80-06 (Modified) in Table AP1-1. Drawing 421-8-06 was assembled in 1990 at the request of the AFSC to consolidate USAF Drawings 9210827 through 9210832 and 9484969 under one drawing number.	
421-80-06 flow through version	UNK	RC Box	UNK	14-Sep-00	DDESB site approval was granted for the construction of 2 modified Hayman igloo (421-80-06 with two headwalls) at Kunsan Air Base, Korea. The structures were required to be treated as Undefined ECM. Doors can be upgraded to meet 7-Bar criteria.	
422-264-03	11-May-90	RC Box	Savannah District COE	2-Apr-02	An early version of the Air Force MSM. Unlike MSM design 9210827 through 9210832 (Hill AFB) and 9484969 (Eglin AFB), this design cannot be upgraded to a 7-Bar design because it has a weaker roof design. Has always been considered an Undefined ECM.	
516667	?	Steel Arch	Bureau Y&D	UNK	Superceded by Bureau Y&D Drawing 6027803. No additional information is available.	
544839 through 544842	25-Feb-52	RC Box	Bureau Y&D	UNK	Smokeless Powder and Ammunition Storage Magazine. Known to have been constructed at McAlester AAP. Front wall has glass block windows installed approximately 10 feet above floor level to let in natural lighting.	
550-001 & 550-002	2-Sep-41	RC Arch	Red River Ordance Depot	2004	Though the door header and pillasters are reinforced and a 10-inch thick headwall is provided, the headwall reinforcing is 6 X 6 wire mesh, which does not provide the required headwall strength. Door details not available at this time - no drawing. Constructed at Red River Ordnance Depot.	
6027801	1-Mar-75	Steel Arch	NCEL	UNK	This is a 1,200 square-foot High Explosive Magazine. The design's grounding system does not meet current explosives safety grounding criteria. The magazine was designed by the Civil Engineering Support Office, Naval Construction Battalion Center, Pt. Hueneme, CA.	
6027802	1-Mar-75	Steel Arch	NCEL	UNK	This is a 576 square-foot High Explosive Magazine. The design's grounding system does not meet current explosives safety grounding criteria. The magazine was designed by the Civil Engineering Support Office, Naval Construction Battalion Center, Pt. Hueneme, CA.	
6027803	1-Mar-75	Steel Arch	NCEL	UNK	Superceded Bureau Y&D Drawing 516667. This is a 192 square-foot High Explosive Magazine . The design's grounding system does not meet current explosives safety grounding criteria. The magazine was designed by the Civil Engineering Support Office, Naval Construction Battalion Center, Pt. Hueneme, CA.	
649602 through 649605,793749, and 803060	5-Mar-54	RC Arch	Bureau Y&D	9-May-84	DoD 4145.27M, March 1969, identified this magazine as a non-standard structure, permited to store 250,000 pounds NEW at a minimim separation distance of 185 feet. A 9 May 1984 DDESB memorandum confirmed that it was a non-standard ECM.	

TABLE AP1-3. UNDEFINED ECM
6 January 2011

DRAWING NO. (NOTE 1)	DRAWING DATE	DESCRIPTION	DESIGNER	DDESB REVIEW DATE (IF KNOWN)	COMMENTS: (NOTES 2 AND 3)	NOTES:
652-295 and 652-296	20-Jun-33	RC Arch	OQMG	UNK	See description information provided in paragraph C2.2.2.6.	
652-311 and 652-312	19-Jul-28	RC Arch	OQMG	UNK	See description information provided in paragraph C2.2.2.5. Treat as an above-ground magazine, unless the required 2-foot of earth cover is provided. The design may need to be evaluated to insure the structure is capable of safely supporting 2 feet of earth.	
652-317 through 652-320	9-Dec-35	RC Arch	OQMG	UNK	See description information provided in paragraph C2.2.2.7.	
652-326 through 652-331	23-Jul-37	RC Arch	OQMG	UNK	See description information provided in paragraph C2.2.2.7.	
652-340 through 652-349	27-Sep-40	RC Arch	OQMG	UNK	See description information provided in paragraph C2.2.3.1. These drawings were lost shortly after approval and were replaced by Drawings 652-377 through 652-386.	
652-377 through 652-386	30-Oct-40	RC Arch	OQMG	UNK	See description information provided in paragraph C2.2.3.1.	
652-394 & 652-395	UNK	UNK	OQMG	UNK	Referenced on Red River Ordnance Depot, Texarkana, TX, drawing 550-001.	
652-535 through 652-537	13-Feb-41	Steel Arch	OQMG	UNK	Superceded OQMG Drawing 652-354. The arch is construced of 7-ga. corrugated steel panels. The design provided for 2-foot of earth cover.	
652-686 through 652-692	27 Dec 41, Revised 14 Mar 42	RC Arch	OCE	24-Dec-98	This ECM design was tested as part of the 1946 Naval Proving Grouns, Arco, Idaho, tests. The 130th ASESB (18 May 53) acknowledged COE Drawings 652-686 through 652-694, dated 27 Dec 41, revised 14 Mar 42, as a Standard ECM. 1Dec 55 ASESB QD Standards list this ECM as a standard, with 185-foot separation for barricaded, 360-foot separation for unbarricaded. A 24 Dec 98 DDESB ltr states that an ECM constructed to Drawings 652-686 through 652-692 is not robust enough to qualify as a 7-Bar ECM. However, it is robust enough to protect its contents if it is spaced about 400 feet from a detonation of 500,000 pounds NEW in an adjacent ECM. In addition, these ECM constructed with "Medium" or "Rock Only" footings do not satisfy present requirements for electrically continuous reinforcing steel, therefore ECM with these type footings do not meet current lightning protection criteria. Superceded by 33-15-01 listed above. If distances cannot be met, then the ECM must be treated as an undefined ECM.	
6521000 through 6521010	19 Feb & 23 Mar 42	RC Dome	OCE	12-Jul-90	Called a Corbetta, Beehive, or Dome Magazine. At a 23 Feb 1942 meeting, the Joint Army and Navy Board of Ammunition Storage (predecessor of ASESB) approved the Corbetta Magazine as an alternate type magazine (i.e. Non-Standard). A 12 Jul 90 DDESB ltr approved a 27 Nov 89 COE ltr, requesting approval to modify doors on Corbetta Type ECM at Volunteer Army Ammunition Plant (AAP) and Holston AAP. Once modified, each ECM can be sited for 500,000 pounds NEW, provided the conditions of Note4 below were met. If distance cannot be met, then the ECM must be treated as an undefined ECM.	4
652-1012 through 652-1014	29-Apr-42	RC Arch	OCE	UNK	Known as the Huntsville Magazine. This was a redesign of the Series 652686 through 652693 magazine, and its purpose was to conserve critical wartime materials. Reinforcing steel was reduced. The headwall stubbed by removal of wingwalls (earth fill spilled around front corners). The door was changed to a 6-foot, double-sheet steel. The headwall thickness was reduced to 8 inches.	
652-1017 and 652-1018	13-May-42	AG (see comments)	OCE	UNK	Known as the "Richmond"-Type Magazine (see C2.2.3.5). This is an aboveground structure constructed of massive masonry walls and a built-up wood frame roof. It was frequently called an igloo, which was incorrect. Site as an aboveground magazine.	
6579-160 & 6579-161	12-Mar-29	RC Arch	OQMG	UNK	This magazine, as shown on the drawing, has insufficient earth-cover to qualify as an earth-covered ECM under today's standards. Treat as an aboveground magazine, unless earth-cover has been increased to meet the minimum required 2 feet of depth.	

TABLE AP1-3. UNDEFINED ECM
6 January 2011

DRAWING NO. (NOTE 1)	DRAWING DATE	DESCRIPTION	DESIGNER	DDESB REVIEW DATE (IF KNOWN)	COMMENTS: (NOTES 2 AND 3)	NOTES:
*7013623 through 7013638	11-Sep-76	RC Arch	NAVFAC	8-Dec-04	This design was constructed at Naval Support Activity, Diego Garcia. Based on DDESB review of the magazine design, it is considered an Undefined ECM. The basis for this decision is the headwall reinforcing which used 4 X 4 wire mesh. This reinforcement is not capable of providing 7-Bar protection to magazine contents.	
7115-1400	UNK	RC Arch	OQMG	UNK	This Lone Star AAP drawing indicates that the details on this drawings were copied from 7115-1400.4. No date was given for the original drawing, though the copy effort was completed on 20 June 1969. Base on the original drawing number, the reinforcing design and door design shown, it is suspected that this an early 1940 era design. The drawing indicates 59 - 40'2" L X 26' 6" W; 138 60' 8" X 26' 6"; and 45 80' 8" X 26' 6" were constructed at Lone Star AAP per this drawing.	
7120-8101 and 652-538	27 Jan 1942/16 July 1941	RC Arch	OQMG	UNK	This design provided the contractor the option of replacing reinforcing bars with wire mesh at his option. The door is a 4-inch thick concrete door reinforced with 6" X 6" wire mesh on each face. Drawing 652-538 is for a concrete door design that has a bronze copper weatherstrip attached to the inside edge of the door. When the door closes, the copper weatherstrip presses against the steel angle that forms the door frame. This design may provide a ground path for the door, but it needs to be tested. This magazine design is known to have been constructed at Redstone Arsenal, AL.	
749767 through 749770	1956	RC Box, Type IIA	Bureau Y&D	UNK	Smokeless Powder/Projectile Magazine, Type IIA (52 feet X 161 feet). DDESB approval of this design (6 Oct 1976) as a standard magazine design was site specific for NAVWPSTA Yorktown only. In their approval letter, the DDESB encouraged the Navy to pursue designating this ECM as a standard design. No documentation has been found to show if this was ever performed. Original design of this drawing number had glass block windows in the magazine face to allow natural lighting to enter. Change C (dated 5 Jul 61) removed the glass blocks. DDESB approval as a Standard magazine was based on an analogous comparison of structural features to OCE 33-15-64. ESKIMO VI tested a similar magazine design (Bureau Y&D 749771 - 749774), which failed to meet Standard Magazine criteria.	
749771 through 749774, and 793751	31-Jul-56	RC Box, Type IIB	Bureau Y&D	UNK	Smokeless Powder/Projectile Magazine, Type IIB (52 feet X 97 feet). The original design had glass block windows in the magazine face to provide natural lighting within the magazine. Change C (dated 5 July 1961) removed the glass blocks. This magazine was tested by ESKIMO VI and failed to meet Standard magazine criteria, therefore it's considered an undefined ECM.	
752296 through 752299, 793749	UNK	RC Box	Bureau Y&D	UNK	Type 1, Smokeless Powder/Projectile Magazine (52-foot X 103-foot). Bureau Y&D Drawing 817109, dated 7 January 1958, provides general details of this magazine and was used for planning purposes.	
764596 &764597	7-Sep-56	RC Arch	Bureau Y&D	15-Jul-83	Superceded by Bureau Y&D Drawing 1404310 through 1404324, which provided for a redesigned headwall and door design to reflect the latest blast loading data gathered from ESKIMO testing. Treat all existing construction as Undefined.	
FE-8101	11-May-87	RC Arch	Redstone Arsenal, AL	24-Jun-10	Considered as an Undefined ECM, unless modified with a new door IAW DDESB-PD approval memo of 24 June 2010 (see Table AP1-1).	
X8745127 through X8745138, X8745146, and X8851911	UNK	RC Box	Hill AFB	2-Apr-02	An early version of the Air Force MSM. Unlike MSM design 9210827 through 9210832 (Hill AFB) and 9484969 (Eglin AFB), this design cannot be upgraded to a 7-Bar design because of its weaker roof design. Has always been considered an Undefined ECM.	
895065	UNK	RC Box	Bureau Y&D	UNK	Type II Missile Magazine. This design had six 11-foot wide X 11-foot high doors.	
895066	UNK	RC Box	Bureau Y&D	UNK	Type 1 Missile Magazine. This design had three 22-foot wide X 11-foot high doors.	

TABLE AP1-3. UNDEFINED ECM
6 January 2011

DRAWING NO. (NOTE 1)	DRAWING DATE	DESCRIPTION	DESIGNER	DDESB REVIEW DATE (IF KNOWN)	COMMENTS: (NOTES 2 AND 3)	NOTES:
9210827 through 9210832 (Hill AFB) and 9484969 (Eglin AFB)	9-Apr-93	RC Box	Hill AFB/Eglin AFB	2-Apr-02	Superceded by 421-80-06. This MSM design was previously approved as a 7-Bar ECM by DDESB-KT Memo of 20 July 1994. It's structural rating was downgraded to "Undefined" by the DDESB in Apr 2002 due to identified problems with the door design. The door and door frame can be upgraded per DDESB memo of 17 Apr 02 in order to be again considered a 7-Bar design. See 421-80-06 (Modified) in Table AP1-1. (NOTE: Eglin AFB drawing 9484969 is a consolidation of Sheets S-8 and S-9 (doors and doorframe assembly) from Savannah District COE Drawings 422-264-03, dated 11 May 1990.)	
952127 through 952135	13-Dec-61	RC Box	Bureau Y&D	UNK	Type I Missile Magazine. This design had three 22-foot wide X 11-foot high doors.	
Korean ECM	No number	Steel Arch	Korean	3-Dec-76	DDESB review this design and determined that the door would not provide the required level of protection to the contents of the ECM, therefore, the design was was not considered equivalent to a standard ECM design. New Korean magazines are constructed to the Korean Version of 33-15-74, a 7-Bar design.	
M-30792	4-May-86	Steel Arch	AF	UNK	This design was developed by Eglin AFB. The ECM is 39 feet deep and has an internal radius of 13 feet. No approval documentation could be found for this design.	
Modified Type 16 for Air Force use	UNK	RC FRELOC Stradley	COE (EUR Dist)	30-Apr-91	COE (Europe) developed this modified TYPE 16 magazine design for Air Force use. This design modified the headwall to incorporate a 16-foot door opening. Ten of these modified magazines were to be constructd at Ramstein Air Base, Germany, by FY90 MCP, Project PAZY 90372.	
Munitionslagerhause (MLH) 30B	UNK	RC Box	German	UNK	A 15 September 1986 Department of Army letter from Commander, V Corps (Attn: AETV-GAS) states that the MLH30 is identical to the MLH25, which was approved by the DDESB and constructed in FSTS Ottrau and FSTS Giesel. The letter states that the MLH30 is rated at 7-Bar. Sixteen MLH30 ECM were constructed at PSP4J, Muenster, Germany. Their separation distances were K=1.25W1/3 (side to side) and K=2.0W1/3 (front to rear), both applicable to the siting of standard magazines. The 15 September 1986 letter applied a 5,000 kg (11,023 lb) peace-time limit to the Muenster MLH30 ECM. Approval documentation has not been found. Treat as an undefined ECM until supporting information is provided to change the designation.	
Shipping Container, Earth-Covered	UNK	ISO and MILVAN container	DAC	22-May-95	The DDESB approved the use of earth-covered MILVANs and ISO Containers as undefined ECM, for NEWs up to 4,000 kg (8,800 lbs.), provided the earth-covering criteria of DAC letter SMCAC-EST (385{A}) of 10 February 1995 were met. Attachment C of this letter provides three methods for insuring the required earth-cover is provided. There is no reduction in ESQD as a result of these designs, however, containers meeting these criteria can be sited as undefined ECM with respect to adjacent AE storage structures.	
USAREUR German Type II	UNK	RC Box	German	10-Dec-68	A 10 December 1968 ASESB approved a 330,000 pound NEW explosives limit for this magazine. A 21 September 1983 DDESB letter stated that for new construction involving this magazine, then the magazine shall be considered as a non-standard (undefined) magazine and sited accordingly.	5
USAREUR German Type III	17-Apr-68	RC Box	German	10-Dec-68	A 10 December 1968 ASESB approved a 330,000 pound NEW explosives limit for this magazine. A 21 September 1983 DDESB letter stated that for new construction involving this magazine, then the magazine shall be considered as a non-standard (undefined) magazine and sited accordingly.	5
USAREUR German Type IIIA	UNK	RC Box	German	10-Dec-68	A 10 December 1968 ASESB approved a 330,000 pound NEW explosives limit for this magazine. A 21 September 1983 DDESB letter stated that for new construction involving this magazine, then the magazine shall be considered as a non-standard (undefined) magazine and sited accordingly.	5

TABLE AP1-3. UNDEFINED ECM
6 January 2011

DRAWING NO. (NOTE 1)	DRAWING DATE	DESCRIPTION	DESIGNER	DDESB REVIEW DATE (IF KNOWN)	COMMENTS: (NOTES 2 AND 3)	NOTES:
USAREUR German Type IV	UNK	RC Box	German	10-Dec-68	A 10 December 1968 ASESB approved a 330,000 pound NEW explosives limit for this magazine. A 21 September 1983 DDESB letter stated that for new construction involving this magazine, then the magazine shall be considered as a non-standard (undefined) magazine and sited accordingly.	5

Notes accompanying Table AP1-3:

1. Each line represents a separate ECM design. This listing identifies ECM designs that were approved as either "Non-standard" or "Undefined", and also includes those ECM designs for which no documentation could be found to support a structural designation other than "Undefined". Where UNK appears in the table, it indicates that no information was found for that particular field.

2. "Undefined" ECM are currently permitted to store up to 500,000 pounds NEW of HD 1.1. Prior to 1992, a Non-standard ECM was only permitted to store a maximum of 250,000 pounds HD 1.1. [**Note**: Previously approved ECM site approvals, for NEW not exceeding 250,000 pounds remain valid; however, a DDESB site approval is required for any increase beyond 250,000 pounds HD 1.1].

3. Assignment of an ECM to this table does not necessarily mean that it cannot provide 7-Bar or 3-Bar protection. A number of the magazine designs listed could potentially be capable of providing 7-Bar or 3-Bar protection; however, their structural strengths have never been analyzed or tested.

4. Storage of up to 500,000 pounds NEW of HD 1.1 is permitted in Corbetta-type ECM, provided it has been modified with one of the two approved door designs and the required separation distances are met, as discussed in Note 6 of Table AP1-2.

5. Side-to-side of 2 $W^{1/3}$ is required for existing ECM.